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OPERATIONAL IMPROVEMENTS  
TO THE  
U.S. SUBMARINE LAUNCHED BALLISTIC MISSILE  
ENABLE THIS LEG OF THE STRATEGIC TRIAD  
TO ASSUME THE ROLE OF THE  
U.S. INTERCONTINENTAL BALLISTIC MISSILE

by

CRAIG C. WHITEHEAD

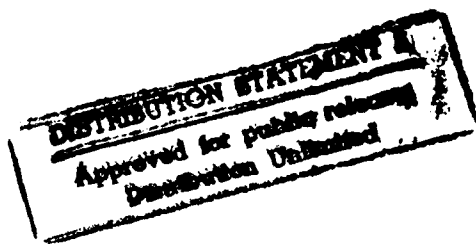
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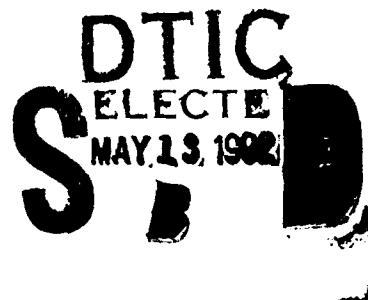
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The submarine launched ballistic missile (SLBM) force has long been considered the most survivable and enduring of this nation's nuclear triad--manned bombers, intercontinental ballistic missiles (ICBM), and SLBMs. Historically the SLBM leg has depended upon the ICBM to provide the promptness and destructive capability essential to this nation's strategic nuclear deterrence policy. The deployment of the Trident II (D-5) missile eliminates this dependence. This latest SLBM provides the promptness and the destructive capability to enable it to assume the operational role previously fulfilled by the ICBM force. This paper will examine the roles of our nation's nuclear forces in support of the strategic nuclear deterrent policy. It will briefly describe the characteristics of each leg of the triad. It will discuss the operational improvements to the SLBM force which enable it to assume the role of the ICBM in nuclear deterrence. Then, some additional operational improvements will be addressed to further emphasize the enhanced characteristics of the SLBM force. Finally, a few concerns over the SLBM assuming the role of the ICBM will be discussed. As a result of these operational improvements it can be concluded the SLBM can assume the role of the ICBM.

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CHAPTER I

INTRODUCTION

President Bush announced on September 27, 1991, during a 20-minute televised address, initiatives affecting the entire spectrum of U.S. nuclear weapons. He stated: "We have an unparalleled opportunity to change the nuclear posture of both the U.S. and Soviet Union."<sup>1</sup> Recent developments within the now historic Soviet Union make this opportunity even more realistic. During his announcement, the President stated he had directed the formation of a new joint nuclear war fighting organization called U.S. Strategic Command (USSTRATCOM). This new command will become official in June 1992 and will be completely established by December 1992.<sup>2</sup> USSTRATCOM will then have operational control of this nation's strategic nuclear triad--manned bombers, ICBMs, and SLBMs. The author believes this new command has the opportunity to introduce operational "changes" to the strategic nuclear posture of the United States.

This opportunity exists for three reasons: First, the threat has gone. Communism has collapsed and the cold war is over. Second, the United States cannot afford the nuclear triad. The fiscal realities will cause policy makers to realize the triad is a luxury we can no longer afford. Third, and

overriding the previous two in importance, the operational improvements to the SLBM force enable this leg of the strategic triad to assume the role of the ICBM force. To be sure, some would argue the threat has not gone away. They rightfully assert the new Russian Republics still have the *capability* to destroy the United States. Some would also maintain the United States cannot afford, in the interest of national security, to do away with the strategic nuclear triad. These arguments are valid and must be considered. However, even considered, the operational improvements of the SLBM force make it possible for this leg of the triad to assume the role of the ICBMs with no increased risk to U.S. national security. The focus, therefore, of this paper will be on the operational improvements to the SLBM force which make it possible for it to assume the role of the ICBM force.

## CHAPTER II

### THE NATIONAL DETERRENCE POLICY & THE U.S. STRATEGIC NUCLEAR TRIAD

The starting point for any discussion on the role of strategic nuclear forces must be the national guidance. In his fiscal year 1991 Annual Report to Congress, Secretary of Defense Richard Cheney described the U.S. strategic nuclear deterrent policy by stating: ". . . three fundamental objectives will continue to underpin U.S. strategic nuclear policy in the future. Maintaining effective deterrence, so that a potential aggressor would conclude that the cost of an attack against the United States or its allies would far exceed any expected gain. Fostering nuclear stability, a condition whereby no nation is pressured to use nuclear weapons preemptively. Maintaining the capability, if deterrence fails, to respond flexibly and effectively to an aggressor's attack."<sup>1</sup> To achieve these fundamental objectives, the strategic nuclear deterrent force requires certain characteristics:

SURVIVABILITY - Avoid destruction by enemy attack

PROMPTNESS - Rapid response to National Command Authorities

ENDURANCE - Forces can be employed throughout conflicts

FLEXIBILITY - Employment options and tailored response

DESTRUCTIVE CAPABILITY - Combined range, accuracy and yield.<sup>2</sup>

The U.S. strategic nuclear triad has provided the foundation to achieve this strategic nuclear deterrence policy



for the past 40-plus years. These basic characteristics must be preserved even with the victory of the cold war and collapse of the Soviet Union. What follows is a discussion on the characteristics of each of the nuclear strategic legs.

The strategic nuclear triad is a synergistic creation of forces. The respective characteristics of each leg of this triad create a deterrent as well as retaliatory force.

#### Strategic Manned Bomber

Survivability - The day-to-day survivability of the manned bomber is dependent on early tactical and strategic warning. Early warning became more critical to survival when President Bush announced on September 27, 1991 that he was lifting the alert status of the bomber force.<sup>3</sup> Bombers launched on warning still face a penetration problem. Stealth technology should provide additional survivability.

Promptness - Bombers are mobile assets which have a response time depending on the location relative to the target. In most cases, a bomber response time is hours rather than minutes. This response time allows positive control of nuclear weapons from launch to weapon detonation.

Endurance - The bomber's capability to attack and deliver weapons, return and reload, and then attack again provides a destructive force expected to endure throughout the conflict.

Flexibility - The bomber provides the highest measure of controllability and flexibility. It has the capability of responding to unforeseen and rapidly changing targets. It can be launched for survival to either provide a show of force or

intent. A most important characteristic is its ability to be recalled. It can be recycled and redirected. Having the man-in-the-loop provides the ability for observation and evaluation of assigned targets. This weapon system is ideal for look-shoot and relocatable targets.

Destructive Capability - The combination of mixed penetrating and standoff strategic weapons provide the best contribution of accuracy and weapon yield compared to any current or projected system.<sup>4</sup>

#### Intercontinental Ballistic Missiles

Survivability - Even super-hardened fixed missile silos are expected to be destroyed by super-accurate warheads.<sup>5</sup> According to the Department of Defense publication, "Soviet Military 1988," a 2-on-1 Soviet attack on our ICBMs in their silos would destroy 65 to 85 percent.<sup>6</sup> Thus, these "use 'em or lose 'em" silo-based ICBMs are the least survivable of the strategic forces.

Promptness - Generally felt to have an advantage over the other strategic systems with a more assured command and control.<sup>7</sup> A quick time-to-target delivery capability with the highest on-alert rate of the nuclear forces ensures the promptness required of nuclear deterrence. These missiles have the capability to reach targets over 6,000 miles away in less than 30 minutes.

Endurance - The ICBM's fixed-silo vulnerability also limits its endurance. Few ICBMs are expected to survive an initial attack. These surviving ICBMs would be at significant risk.

After launch, ICBM silos cannot be reasonably reloaded which further limits the ICBMs destructive contributions throughout the conflict.

Flexibility - Improvements to the Minuteman III and Peacekeeper missiles provide the ability to rapidly retarget as circumstances change. Once launched ICBMs cannot be retargeted or recalled.

Destructive Capability - The Peacekeeper and Minuteman III ICBM can be targeted against hardened targets such as ICBM silos and command bunkers.<sup>8</sup>

#### Ballistic Missile Submarines

Survivability - The SLBM is the most survivable leg of the triad. Our ability to conceal the location of our submarines in the open ocean provides excellent survivability.

Promptness - Historically, due to the perception that the National Command Authorities (NCA) may not be able to rapidly communicate with the SLBMs, this system's promptness has been criticized.

Endurance - The SLBM possesses the advantage of being able to stay submerged and hidden in the depths of the ocean for months. The missiles they carry may be reasonably held in reserve rather than used early in the conflict.<sup>9</sup>

Flexibility - The SLBM, like the ICBM, has retargeting capability prior to launch. Also like the ICBM, these missiles cannot be retargeted or recalled after launch.

Destructive Capability - This along with the perceived inability to provide a prompt response to the NCA were

considered the two operational weaknesses of this nuclear force.

Thus, each leg of the triad has unique characteristics which work together synergistically to provide a deterrent and retaliatory capability no adversary could hope to fully neutralize.<sup>10</sup> The table below illustrates these characteristics.

TABLE I  
STRATEGIC NUCLEAR FORCE CHARACTERISTICS

	BOMBER	ICBM	SLBM
SURVIVABILITY	DEPENDS <sup>a</sup>	NO	YES
PROMPTNESS	NO	YES	NO > YES <sup>b</sup>
ENDURANCE	YES	NO	YES
FLEXIBILITY	YES	YES/NO <sup>c</sup>	YES/NO <sup>c</sup>
DESTRUCTIVE CAPABILITY	YES	YES	NO > YES <sup>b</sup>

<sup>a</sup> The survivability depends upon tactical and strategic warning.

<sup>b</sup> Historically, the SLBM lacked promptness and destructive capability, however, operational improvements discussed in Chapter III give it these characteristics.

<sup>c</sup> Prior to launch the ICBM and SLBM can be flexibly retargeted. After launch neither can be retargeted or recalled.

Source: U.S. Naval War College, Total Force Planning 8, Handout, Arms Control Exercise, Fall 1991.

Two conclusions can be made from this discussion and the above table. First, the manned bomber's particular characteristics of assured control of nuclear weapons from launch order to weapon detonation, flexibility, endurance, and extremely destructive capability make it an essential element in

nuclear deterrence. Second, the SLBM force historically lacked the promptness and destructive capability of the ICBM force. Up until the deployment of the Trident II (D-5) weapon system, the SLBM relied upon the ICBM force to provide these characteristics essential to meet the strategic nuclear deterrent policy. The next chapter will discuss SLBM operational improvements in these two areas which enable it to assume the role of the ICBM in nuclear deterrence.

OPERATIONAL IMPROVEMENTS TO THE U.S.  
BALLISTIC MISSILE SUBMARINE FORCE

CHAPTER III

SLBMs have improved significantly since the first nuclear missile submarine, the USS George Washington, was deployed in late 1960. The table below illustrates these improvements.

TABLE II  
CHARACTERISTIC AND CAPABILITIES OF U.S. SLBMs

	ACCURACY	YIELD	MAXIMUM RANGE
POLARIS A-1	1nm/6,000ft	W47 (600 Kilotons)	1,200nm
POLARIS A-2	.5nm/3,000ft	W47 (800 Kilotons)	1,500nm
POLARIS A-3	.5nm/3,000ft	W58 (200 Kilotons)	2,500nm
POSEIDON C-3	.28nm/1,700ft	W68 (50 Kilotons)	2,500nm
TRIDENT C-4	.27nm/1,640ft	W76 (100 Kilotons)	4,000nm
TRIDENT D-5	.07nm/425ft	W88 (475 Kilotons)	4,000+nm <sup>a</sup>

<sup>a</sup> By reducing the number of reentry vehicles the range can be increased to over 6,000nm.

Source: Robert S. Norris, Arms Control Today, Counterforce at Sea - The Trident II Missile, p. 9.

Enhanced Promptness

The lack of promptness of the SLBM force has long been a criticism. Many experts felt this system had inadequate communications for rapid response to NCA orders. While perhaps once correct this problem has been resolved. Submarine

communications are comprised of the very low frequency (VLF) network augmented by low frequency (LF) transmitters. This system operates continuously from many locations, on many frequencies, and in several transmission modes simultaneously. Supplementing these fixed VLF and LF transmitters is a mobile VLF transmitter. This mobile transmitter is an EC-130 Hercules aircraft called "Take Action and Move Out" (TACAMO). These TACAMO aircraft can be scrambled by NORAD and fly random patterns over the oceans. They provide a highly responsive and survivable communications link between the NCA and the submarine force. Also, extra low frequency (ELF) communications began in 1988 from sites in Michigan and Wisconsin. Over the years, the operational improvements to each of these communication systems has been tested and improved to ensure a continuing, full control, and reliable link to the NCA.<sup>1</sup>

Perhaps the most significant improvement to these communications capabilities is as a result of the increased range (over 6,000 miles) of the Trident II (D-5) missile. SLBM operating areas can now be much closer to the American coastline. This decreased transmitter to submarine distance improves the reliability of communications. There were only a few VLF and LF transmitters at the end of World War II and these were located on American soil. Today, however, these transmitters cover the globe and are linked by reliable and redundant paths. It would take a world-wide attack on these transmitters to prevent the message from getting to the submarine force. This combination of decreased distance from

the American coastline to the submarine and the redundant transmitters also reduces the jamming threat. Additionally, the VLF and LF systems have improved sufficiently to expect transmissions to be delivered until the site is physically destroyed.<sup>2</sup>

The ELF system provides another significant operational improvement. The capability allows the SLBM force to assume on-alert status and engage targets from port to patrol area and during the return trip to port. This system broadcasts a continuous signal to the submarine at depths sufficient to allow normal transit speed without having to drag an antenna near, on, or above the ocean surface. The loss of this signal would act as a "bell ringer" to alert the submarine to come near the surface and be prepared to receive messages.<sup>3</sup> Prior to this system, submarines were required to come near the surface every eight hours or so and listen for message traffic. This limited their ability to provide a prompt response.

The increased range and improved communications of the Trident II (D-5) provide another operational improvement which contributes to promptness--higher alert levels. SLBMs can now begin alert at port and continue the alert during transit to and from the assigned patrol area. Improved maintainability has also been built into these submarines which enables a higher alert level. For example, special accesses have been built for removing and reinstalling equipment without having to cut the pressure hull or clear massive equipment in the submarine. Logistical loading and maintenance procedures have also been



improved. The period between overhauls has been increased to ten years. The result of these improvements could increase the time at-sea portion of the submarine's life by 11%.<sup>4</sup> Therefore, the operational improvements of increased range, redundant and reliable communications, and a potentially higher alert rate provide assured command and control and quick time-to-target delivery capability. As Freeman Dyson wrote: "If the message gets out of Washington, it will get to the submarines."<sup>5</sup>

#### Improved Destructive Capability

In order for the SLBM to assume the role of the ICBM it must have a destructive capability equal to that of the ICBM. Prior to the Trident II (D-5) the SLBMs were capable of delivering very high yield warheads. For example, (see Table II) the Polaris (A-2) delivered a W47 warhead with an 800 kiloton yield. However, the Polaris, like all others prior to the Trident II (D-5), lacked the combination of adequate range, accuracy, and yield necessary to be targeted against hard-kill targets such as silo-based ICBMs and hardened command bunkers. The Trident II (D-5) has all three--range, accuracy, and yield necessary to destroy these hard targets.

The increased range has been discussed above. The improved accuracy and yield of the Trident II (D-5) are as a result of an eight-year improved accuracy program in which over 800 techniques were reviewed. It has improved submarine navigation and missile guidance systems, including an enhanced stellar inertial guidance system, wherein the missile fixes its position on the stars to correct its flight. For very hard-kill target

capability, the Trident II (D-5) can be armed with the 475 kiloton yield MK5/W88 reentry vehicle. It can also be armed with a lesser yield (100 kiloton) reentry vehicle. Each missile will carry only one type of warhead, but a submarine will be able to vary the mix of missiles.<sup>6</sup>

This improved destructive capability of the Trident II (D-5) makes it equal to that of the most modern ICBM. The following table compares these two weapon systems.

TABLE III  
TRIDENT II (D-5) / PEACEKEEPER COMPARISON

	ACCURACY	YIELD	MAXIMUM RANGE
TRIDENT II D-5	120 meters	MK5/W88 475 Kilotons	11,118 km 6,909 mi
PEACEKEEPER	120 meters	MK21/W87 475 Kilotons	11,118 km 6,909 mi

Source: U.S. Naval Institute. Weapons Systems/Platforms, Missiles/Rockets. U.S.N.I. Military Database, Jan 1992.

Thus, the criticisms of lack of promptness and destructive capability, though true previously, have been overcome by years of significant operational improvements to the SLBM force.

## ADDITIONAL OPERATIONAL IMPROVEMENTS & CONCERNS

### CHAPTER IV

There are several additional operational improvements to the SLBM force. This chapter will discuss the Trident submarine's increased survivability. It will also discuss some advantages the new USSTRATCOM will have on the SLBM force. Then, a few concerns of having the SLBM assume the role of the ICBM will be discussed. Each of these additional operational improvements further makes the point that the SLBM can assume the role of the ICBM in providing strategic nuclear deterrence.

#### Increased Survivability

The SLBM has long been considered the most survivable of our strategic forces. The new Trident II weapon system will provide even greater survivability. Some fear a technological breakthrough will render the SLBM force impotent as a nuclear deterrent. However, these SLBMs are faster and quieter than design specification.<sup>1</sup> This submarine's use of a 90,000-horsepower nuclear fueled reactor allows faster travel and the use of a highly advanced single screw provides a combination of speed, quietness, and reliability.<sup>2</sup> Due to increased range, the Trident II can operate in over 12 million square miles of open ocean--an area one hundred times the size of its predecessors of the 1960s.<sup>3</sup> This is an area roughly four times the size of the United States. Our ability to conceal the location of our submarines in the open ocean is greater than a potential enemy's ability to detect them.<sup>4</sup> Experts feel the United States had a

conservative ten-year lead on the former Soviet Union in submarine technology. Our submarines should continue to remain invulnerable for the foreseeable future. Even if the capability existed for an enemy to locate our submarines, the ability to attack and destroy them would require penetration of our naval surface forces--the world's only true "blue water" navy.

Also adding to the Trident II's survivability is the improved fire control system which will allow the submarine to launch larger salvos more quickly. Some estimate that all twenty-four missiles could be fired in less than ten minutes.<sup>5</sup> This provides a significant at-sea, counter force capability considering two-thirds of the submarine fleet will be routinely on patrol at any given time. This further complicates enemy anti-submarine warfare efforts.

#### Organizational Structure

The formation of USSTRATCOM provides two operational advantages to the SLBM force. First, this new command structure gives the navy a leading role in commanding this nation's nuclear forces. Captain William C. Green wrote in 1982: "The plain fact is that the navy does not have an effective advocate in its top echelons for strategic nuclear weapons systems."<sup>6</sup> Prior to the formation of USSTRATCOM, the navy had a one-star admiral in charge of nuclear strategy with a navy captain responsible for the nuclear submarine force. Conversely, the ICBMs and manned bombers were commanded by an Air Force four-star general--Commander, Strategic Air Command (CINCSAC). He had a multitude of other flag officers at the Pentagon, at

Headquarters SAC, and in the field.<sup>7</sup> The new commander, (CINCSTRATCOM) will wear four stars. The position will alternate between the Air Force and the Navy. The first commander will be an Air Force general. His vice commander will be a navy three-star admiral. When CINCSTRATCOM is a navy admiral, his three-star vice will be from the Air Force. Thus, for the first time in history, the navy has the horsepower to make the case for the operational improvements and capabilities of the SLBM.

The second advantage to this new command is that it simplifies the chain of command. When formed the NCA only needs to contact USSTRATCOM in Omaha, Nebraska when giving orders rather than three separate organizations--SAC in Omaha, U.S. Pacific Command in Honolulu, and U.S. Atlantic Command in Norfolk. This organizational structure will also eliminate several layers of organization which currently exists in the command structure.<sup>8</sup>

#### OVERCOMING CONCERNS

The possibility of an anti-submarine technological breakthrough is a concern. The discussion above on the increased survivability of the Trident II weapon system should significantly reduce this concern. Additionally, the collapse of the Soviet Union can only further delay anti-submarine technological research. The new Russian Republics can be expected to focus on saving their economy rather than on expensive strategic military modernization programs.

Another commonly expressed concern about letting the SLBMs

assume the role of the ICBM is that of "putting all your eggs in one basket." All the "eggs" are not in one basket. The manned bomber is critical in the equation to provide adequate strategic nuclear deterrence. Its contributions of endurance, flexibility and destructive capability are essential. All the benefits of having the man-in-the-loop provide an extremely powerful force to the NCA. Given adequate warning, the alert level of this force can be quickly increased and even launched to a survivable airborne alert if the SLBM force was at risk. The increased survivability provided by stealth technology further enhances its complimenting characteristics. Thus, the combination of the characteristics of the manned bomber and the operational improvements to the SLBM eliminate this concern.

Lt Col Glenn C. Waltman in his article: "The Case for Maintaining the ICBMs" expressed another concern. He wrote in reference to the "Homeland Basing" of the ICBMs: "There is only one way for the Soviets to attack silo-based systems: with massive nuclear detonations throughout America's heartland. In contrast, submarines can be attacked at sea . . . . Attacking them [ICBMs] will surely elicit a massive U.S. response...."<sup>9</sup> Admittedly, a submarine attacked and destroyed far out to sea would not have the same impact as massive nuclear detonations on America's "heartland." However, in the absence of ICBMs, there is only one way an enemy could hope to successfully attack and defeat America--attack the nuclear submarines in our ports as well as the many VLF and LF transmitters on our land. It is inconceivable to think that nuclear detonations on these targets

would elicit anything less than a similar massive U.S. response. The submarine ports in Georgia, South Carolina, and Washington are just as much a part of America's "heartland" as the ICBMs based in Nebraska, North Dakota, and Wyoming.

## CONCLUSION

### CHAPTER V

The operational improvements to the SLBM enable it to assume the role of the ICBM in strategic nuclear deterrence. The U.S. strategic nuclear deterrent policy requires that our nuclear forces maintain effective deterrence so a potential aggressor would conclude the cost of an attack on the United States would not be worth the expected gain. It requires nuclear stability which eliminates the need for any nation to use nuclear weapons preemptively. It also requires the capability to respond flexibly and effectively to an attack. The strategic nuclear triad has successfully provided this deterrence for the past forty-plus years. The combined characteristics of survivability, promptness, endurance, flexibility, and destructive capability continue to be essential elements to this deterrence.

Historically, the SLBM relied upon the ICBM characteristics of promptness and destructive capability. This traditional reliance, however, has been eliminated due to the operational improvements to the Trident II (D-5) weapon system. This SLBM now possesses the promptness and destructive capability equal to that of the most modern U.S. ICBM. The improvements to communications and the capability to increase alert levels provide the NCA with the assurance that the submarine will promptly receive the message. The increased combination of range, accuracy, and yield combine to give the Trident II (D-5)



SLBM a hard-target kill capability greater than any of its predecessors and equal to the ICBM. To these operational improvements are added the enhanced survivability and a reorganization which improves the command structure, eliminates unnecessary organizational layers, and gives the navy a much larger voice in making the case for the SLBM to assume a more important role in strategic nuclear deterrence.

These operational improvements to the SLBM provide, as President Bush stated, "an unparalleled opportunity to change the nuclear posture of the United States . . . ." The operational capabilities of the SLBM force give the President and the new USSTRATCOM the opportunity to consider having the SLBM assume the role of the ICBM in defense of America's "heartland" and in support of this nation's nuclear deterrent policy.

## NOTES

### Chapter I

1. "Navy to Move Nukes," U.S. News and World Report, 11 February 1991, p. 30.
2. "SAC Out...STRATCOM IN," Government Executive, December 1991, p. 12.

### Chapter II

1. Dick Cheney, "Nuclear Forces and Strategic Defense," Annual Report to the President and Congress, January 1991, p. 51.
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